November 1981

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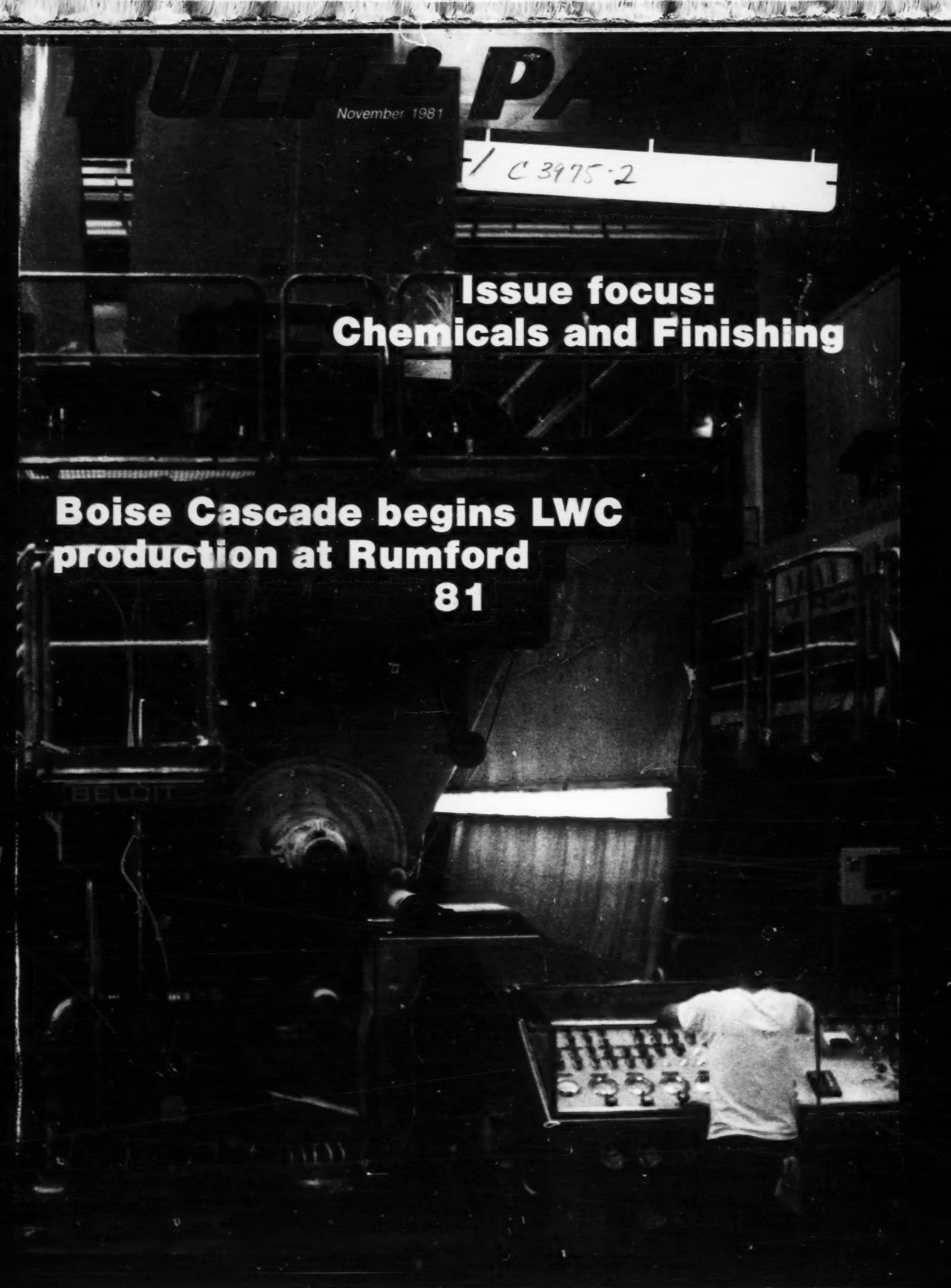
Issue focus: Chemicals and Finishing

Boise Cascade begins LWC production at Rumford 81



PULP & PAPER

Volume 55 Number 11 November 1981

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Cover: Boise Cascade's new 450-tpd paper machine and on-line coater at Rumford, Maine, produces LWC publication papers. (Photo courtesy Beloit.)

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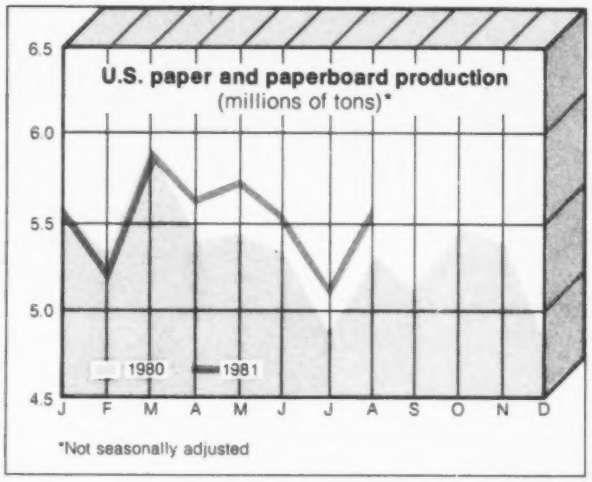
U.S. paper and paperboard production in August reached 5.6 million short tons, an increase of almost 10% over the previous month and up 6.1% over August 1980 levels, according to the American Paper Institute. Seasonally adjusted production for the July-August 1981 period was at a 65.1-million-tpy rate, near the 65.7-million-tpy rate for the year to date.

Among paper grades, newsprint output continued to show the greatest strength, up 11.9% over August 1980 levels. Production of printing/writing grades eased downward in the July-August period from previous months, about matching the average rate for 1980. The rate of production for packaging and industrial papers for the two months was slightly below average 1980 levels. The rate of paperboard production rose in August, with production of export showing a good recovery and kraft linerboard and bleached paperboard showing most of the strength.

Canadian newsprint shipments in August reached 421,000 metric tons, up 13.5% over the August 1980 levels, according to the Canadian Pulp & Paper Assn. January-August shipments were 3.1 million tons, up 12.0% from 1980. Mill operating rates in August were 82%, down from 90% a year earlier.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	August	461	11.9	5,216	12.2
Uncoated groundwood (s)	August	129	1.6	1,458	−3.1
Coated paper (s)	August	426	13.0	4,945	7.7
Uncoated free sheet (s)	August	648	0.3	8,015	−0.6
Unbleached kraft packaging and industrial(s)	August	330	3.1	3,974	—
Tissue	August	380	8.3	4,473	1.6
Total paper	**August**	**2,650**	**5.9**	**31,605**	**3.0**
Kraft linerboard, unbleached	August	1,302	6.2	15,041	4.5
Semichemical medium	August	394	3.4	4,851	2.3
Bleached paperboard	August	336	4.7	4,055	3.4
Recycled paperboard	August	620	11.7	7,287	3.3
Total paperboard	**August**	**2,735**	**6.5**	**32,402**	**3.7**
Total paper and paperboard*	**August**	**5,593**	**6.1**	**66,428**	**3.1**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	July	4,076	3.7	52,561	3.2
Market pulp production	July	480	−11.4	6,194	−5.6
Wastepaper consumption at paper/board mills	July	1,115	7.8	14,785	3.9
Pulpwood consumption (cords)	August	6,526	2.7	80,551	−1.0
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	August	20.434	6.4	165.763†	3.9
Containerboard inventories at box plants	Aug. 1	2,371	3.5		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	July	675	1.7	8,473	−7.7
Imports of Canadian newsprint	July	555	2.8	7,032†	−4.8
U.S. paper exports (including products)	July	415	−14.1	4,980	5.7
Exports of unbleached kraft linerboard	August	180	−27.4	1,950	−20.1
Exports of woodpulp	July	261	−20.9	3,003	−0.7
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	August	421	13.5	3,134†	12.0
Operating rates	August	82%	90%	94%	96%
Inventories held by U.S. consumers	Aug. 31	1,451	19.6		
Woodpulp shipments (export only)	August	377	−36.7	4,487†	−6.5
Operating rates	August	62%	97%	86%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn. *Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

WORLD CAPACITY

FAO sees modest growth in capacity

Estimated worldwide capacity for production of pulp and paper/paperboard will increase in the 1980-85 period at a lower rate than in 1979-84, but at a substantially higher pace than actual 1975-80 growth. So states the latest annual survey of world pulp and paper capacities compiled by United Nations' Food & Agriculture Organization (FAO) through national pulp and paper trade associations. The findings are similar to those of the recent PULP & PAPER INTERNATIONAL "Projects Survey, 1981-83" (P&P, July, p. 31).

World capacity for paper-grade pulp is estimated by FAO to rise from 151 million metric tons in 1980 to 169 million tons in 1985, an annual growth of 2.2%. World paper and board capacity is estimated to rise from 198 million tons in 1980 to 225 million in 1985, a growth rate of 2.6%.

The FAO 1981 survey reports that the ratio of pulp-manufacturing capacity to paper and paperboard capacity is continuing to drop. The apparent ratio of paper pulp to paper in 1970 was 80.5%. This dropped to 77.8% in 1975, 76.3% in 1980, and is expected to go down to 75.3% by 1985.

Paper/board grades. Newsprint is the fastest-growing paper grade, with world capacity to increase from 28.4 million tons in 1980 to 34.6 million tons in 1985—an annual growth of 4.0%. Printing/writing grades are expected to reach a growth rate of 3.4%, rising from 47.2 million tons in 1980 to 55.8 million tons in 1985. Other paper/paperboard grades are forecast to rise from 122.3 million tons in 1980 to 134.4 million tons in 1985—a growth rate of 1.9%/year.

In 1980, 78% of paper and paperboard capacity was in the developed countries, 8% in developing countries, and 14% in the centrally planned economies.

Paper-grade pulp. Estimated capacity increase for 1980-85 in paper pulps is 18.1 million tons. This is comprised of: 1.5 million tons mechanical pulp, 4.8 million tons TMP, 0.9 million tons semichemical pulp, 9.2 million tons chemical woodpulp, and 1.7 million tons in other-fiber pulp.

TMP. The 4.8-million-ton increase in TMP will bring 1980 world capacity of 5.1 million tons to 10 million tons by 1985. More than half this growth (2.7 million tons) is scheduled for North America, where capacity is expected to rise from the 1980 level of 2.3 million tons to 5 million in 1985. The Scandinavian countries will account for an added 1.2 million tons of TMP, bringing their 1985 capacity to 2.6 million.

Chemical woodpulp. World total for chemical woodpulp in 1980 is estimated at 95.4 million tons and should grow 1.9%/year to 104.6 million tons in 1985. Chemical pulp constituted 63% of total capacity of paper-grade pulp in 1980, but is estimated to fall to 62% by 1985. Capacity for sulfite is remaining static or, as in Western Europe, gradually declining. Sulfate pulp constitutes 85% to 95% of chemical capacity in North America, Nordic countries, Japan and Latin America; 65% in Western Europe; and 60% in the U.S.S.R.

Market pulp. Worldwide market pulp capacity, estimated at 27.6 million tons in 1980, is expected to grow 10% to 30.5 million tons in 1985. A small capacity decrease in the Nordic countries is expected. Regional distribution in 1980 is: North America, 11.5 million tons; Scandinavia, 7.3 million tons; the rest of Europe, 3 million tons; U.S.S.R., 1.8 million tons; Latin America, 1.8 million tons; Japan, 1.2 million tons; Oceania, 0.7 million tons; and Africa, 0.3 million tons.

World pulp and paper/paperboard capacity, 1975-85

	Capacity (000 metric tons)			Average annual increase (%)	
	1975	1980	1985	1975-80	1980-85
Total woodpulp, paper grades	126,766	139,417	155,796	1.9%	2.2%
Mechanical[1]	29,988	33,567	39,879	2.3	3.5
Semichemical[2]	10,202	10,492	11,376	0.6	1.6
Chemical	86,576	95,358	104,603	2.0	1.9
Other-fiber pulp	9,344	11,615	13,379	4.4	2.9
Total paper, paperboard	175,002	198,001	224,899	2.5	2.6
Newsprint	25,186	28,410	34,619	2.4	4.0
Printing/writing	38,626	47,186	55,773	4.1	3.4

1. Includes thermomechanical pulp
2. Includes chemigroundwood

World thermomechanical pulp capacity, 1978-85
(000 metric tons)

	Capacity				Increase
	1978	1979	1980	1985	1980-85
World total	3,237	3,872	5,148	9,996	4,848
Developed market economies	3,237	3,837	5,033	9,537	4,504
N. America	1,188	1,508	2,331	5,002	2,671
Japan	621	807	964	1,168	204
Scandinavia	1,276	1,285	1,405	2,615	1,210
Other W. Europe	112	113	187	244	57
Oceania	40	124	146	508	362
Developing market economies	—	35	35	319	284
Latin America	—	—	—	204	204
Asia	—	35	35	115	80
Centrally planned economies	—	—	80	140	60
U.S.S.R.	—	—	80	140	60
Eastern Europe	—	—	—	—	—

FINANCE

Capital spending plans down for '81

The U.S. pulp and paper industry is continuing to lower its sights and will reduce 1981 capital spending by 3.8% from 1980. Pulp and paper companies will spend only $6.54 billion in 1981, down from $6.80 billion last year, according to the latest Commerce Dept. survey taken in July/August. Assuming an 8% to 9% increase in cost of capital goods in 1981, this indicates a hefty decrease in real spending by the industry.

These lowered expectations compare with an expected 0.7% decline reported by Commerce in June and a 1.0% decline reported in March, and with spending increases of 21.2% in 1980 and 39.1% in 1979.

By contrast, Commerce reports U.S. manufacturers as a whole plan to lift 1981 outlays by 9.5% in current dollars, before adjustment for inflation.

Construction paper and board: Production at very low level, growth in housing starts is key to recovery

U.S. Statistics:

Construction papers[1]	1979	1980	1981e
Production, 000 tons†	1866	1398	1250
Capacity, 000 tons	2380	2363	2343
Imports, 000 tons	330	436	400
Exports, 000 tons	34	31	20
Apparent U.S. consumption, 000 tons	2162	1803	1630
Construction boards[1]			
Production, 000 tons†	3650	2722	3000
Capacity, 000 tons	4539	4548	4522
Imports, 000 tons	315	210	230
Exports, 000 tons	53	55	110
Apparent U.S. consumption, 000 tons	3912	2877	3120

1. Includes both insulating and hardpressed boards; does not include wet machine boards. e = estimate †All tons are short tons.

Grade structure: Construction papers include sheathing papers, felts (roofing, auto, floor), asbestos and asbestos-filled, and flexible wood-fiber insulation. Insulation boards include fibrous-felted board (9.5 to 31 lb/ft³) for such uses as interior building and wallboard and acoustical tile. Hardpressed boards include wood fiberboard with a density of over 31 lb/ft³ range, used for cabinet and wall paneling.

Production/capacity: *Construction papers:* 1981 production is estimated to drop to 1.25 million tons, the lowest level in over ten years, an 11% decrease from the 1980 level. Capacity for construction papers has been unchanged for the last five years, at around 2.34 million tons.

Construction boards: For 1981, construction board production will be an estimated 3.00 million tons, an increase of 10.2% over last year. Production of insulation boards was 0.934 million tons in 1980, and should increase to about 0.960 million tons in 1981. Production of hardpressed boards is projected to be 2.000 million tons in 1981, vs 1.79 million tons in 1980.

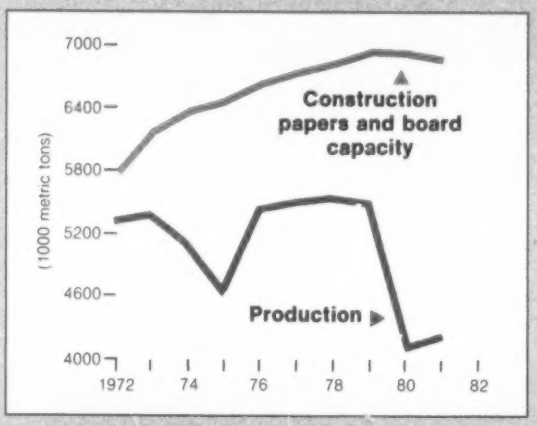
Capacity for both insulation board and hardpressed board have remained basically unchanged for the last few years at 1.87 million tons, and 2.7 million tons, respectively.

Outlook: The demand for both construction papers and board grades is tied closely with the level of activity in the housing and construction industry. A depressed housing market recently has resulted in weak demand for these grades. In 1980, there were 1.3 million units built, down noticeably from the 1.75-million level in 1979.

At the start of 1981, housing starts were forecast to rise to the 1.4- to 1.5-million-unit level and higher. However, many industry observers predict about 1.2 million units to be built in 1981, rising to 1.5 to 1.6 million units for 1982. Even if housing starts do pick up, improving demand for construction papers and board, other market factors come into play that affect the long-term outlook.

First, competition from foam insulation in exterior sheathing threatens to erode insulation board market share.

Construction papers are threatened by competition from fiberglass-base felts, which allows a reduction in the amount of expensive asphalt in the finished product. Fiberglass mat is expected to increase its hold on asphalt roofing products from about 20% to 25% currently to 40% to 45% in 1984.



Estimated capacities for producers of construction papers:	Annual U.S. capacity[1] (000 short tons)	Capacity share (%)
1. GAF Corp.	360	15.4
2. Owens-Corning Fiberglass Corp.	320	13.7
3. Celotex[2]	281	12.0
4. Bird & Son Inc.	204	8.7
5. Genstar Stone Products[3]	192	8.2
6. Certain-Teed Corp.	180	7.9
7. Johns-Manville Corp.	123	5.5
8. Tamko Asphalt Products	120	5.1

1. Includes, in some cases, capacity for inorganic felts.
2. Formerly Lloyd A. Fry Roofing Co. Div.
3. Formerly Flintkote Co.

U.S. capacity (1981): 2.343 million tons.
Capacity share of top five companies: 57.9%.

Estimated capacities of insulation board companies:	Annual U.S. capacity[1] (000 short tons)	Capacity share (%)
1. Celotex Corp.	300	16.0
2. Armstrong World Industries	294	15.7
3. Boise Cascade Corp.	200	10.7
4. U.S. Gypsum Co.	150	8.0
5. Conwed Corp.	95	5.1
6. Johns-Manville Corp.	95	5.1
7. Weyerhaeuser Co.	90	4.8
8. National Gypsum Co.	90	4.8
9. Georgia-Pacific Corp.	85	4.5

U.S. capacity (1981): 1.87 million tons.
Capacity share of top five companies: 55.8%.

Masonite is the major producer of hardboard with an estimated 32% of the market, followed by Celotex (8.5%), Weyerhaeuser (8%), Superwood (7.5%), and Champion International (7%).

Pricing: Wholesale price index of building papers and board (1967 = 100): 1970, 101.2; 1972, 106.4; 1974, 123.5; 1975, 127.1; 1976, 138.8; 1977, 157; 1978, 187; 1979, 182; 1980, 210; 1981, 240e.

Markets: Nearly all forms of construction papers and board are intermediate products and are converted into finished building products. Production by tonnage is: construction papers, 35%; insulation board, 26%; hardpressed tonnage, 39%.

Survey of chemical supply for the pulp and paper industry in the U.S.

PULP & PAPER's annual survey of chemical supply and prices indicates no supply problems through 1982; prices for all chemicals on the rise

By BARRY SHOCKETT

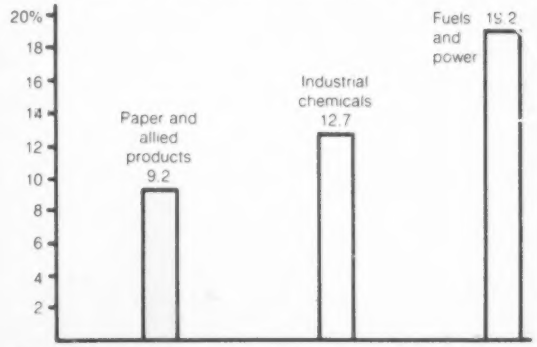
□ Chemicals are generally in adequate supply this year, with some easing of tight 1980 markets. Caustic soda supply is still tight, although it eased somewhat towards the end of the third quarter due to improved chlorine demand. The sulfur market has also loosened as new capacity has come on-stream and demand from other industries has weakened.

Chemical consumption by U.S. pulp and paper mills is at a higher level, overall, than last year. A relatively strong performance by the industry in general, and by some grades in particular, has kept demand high. Through August, paper production is up about 3%, while board mill output is running ahead of last year by about 3.8%. The newsprint and coated paper sectors have been particularly strong, running 12.2% and 6.4%, respectively, ahead of last year through July.

Prices of chemicals used in the pulp and paper industry have continued their inexorable upward climb, putting increasing cost pressures on the mills. For the first eight months of this year, industrial chemical prices rose almost one-third more than the price of products from the pulp and paper industry (see Figure 1). The price of fuels and power rose over 19% during the same period, which was a major contributor to the rise in paper and

Mr. Shockett is the consulting editor-chemicals for PULP & PAPER.

Figure 1. **U.S. price increases for 1981***



* Price increases for chemicals and fuels continued to outpace those for paper products during the first eight months of 1981.

Source: Wholesale price indexes, Bureau of Labor Statistics

Photo courtesy Union Camp Corp.

chemical industry raw material costs. The rise in the cost of fuels in Canada was much larger than in the U.S.

As was the case last year, the price of caustic soda is forecast to rise the most (30%), followed by starch (25%). A 15% rise is expected for chlorine, sodium hydrosulfite, and sulfur (see Figure 2).

The pressure on profits, in an inflationary economy (coupled with a slight recession), was perhaps greatest on the chloralkali producers. For almost a year now, sharp competition has resulted in heavy discounting for chlorine. There have been two attempts to reduce the discounted price (which has been as low as 50% of the official published list), and the industry is waiting to see if the second try will be successful. This would still leave the chlorine selling price about $15 under the published list.

Without noticeable improvements in key markets, such as the housing and automotive industries, chlorine demand will remain stagnant, thus inhibiting the production of caustic. This has led to a rather tight supply situation, recently, for caustic.

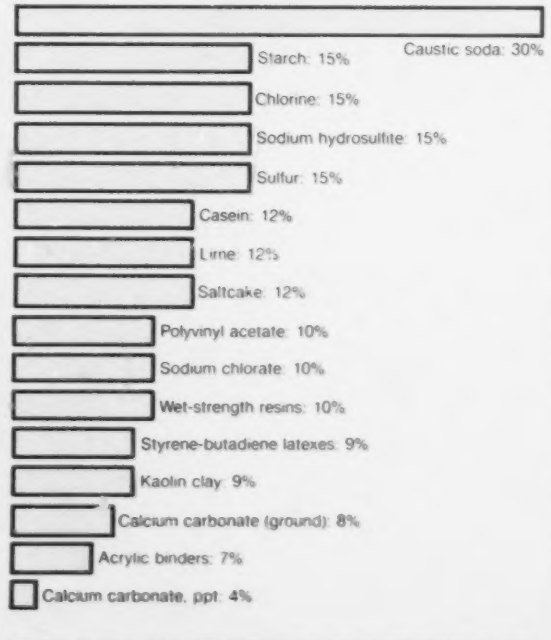
Several of the smaller-quantity pulp and paper chemicals are apparently poised on the verge of substantial increases in demand. Hydrogen peroxide (H_2O_2) demand, for example, could grow as much as 10%/year for the next four or five years, if new applications continue their strong demand. Geothermal energy on the West Coast and in-situ uranium mining are other new areas of potentially good growth for H_2O_2.

Some of the larger-volume commodity chemicals used in the paper industry are not in as short supply as they were in 1980. Saltcake, for example, is readily available, with mills in certain parts of the country having the choice of buying either domestic product or sulfate imported from Canada. The annual growth rate in sodium chlorate demand is expected to increase above the current level of about 7% as the move to chlorine dioxide by many mills continues.

The continuing move to TMP pulping will help to increase demand for bleaching chemicals such as sodium hydrosulfite (as well as H_2O_2), either as a proprietary blend or via the borohydride route.

Most of the miscellaneous chemicals used by the pulp and paper industry are expected to be in adequate supply this year, but prices continue to rise between 7% and 12%, under pressure of raw material costs.

Figure 2. **Projected price increases for major chemicals in 1982**



Definitions

Availability terms are defined as follows:

Very tight—On allocation or demand significantly greater than supply

Tight—Demand slightly greater than supply

Market—Supply and demand in balance, or excess capacity available

Calcium carbonate

Uses: About 85% of the calcium carbonate ($CaCO_3$) consumed by the paper industry is used in coating paper and board. The balance is employed as a filler. Precipitated $CaCO_3$ grades are used in about 70% of the applications, but ground natural $CaCO_3$ continues to find increased usage as finer grades are introduced.

Demand: Estimated consumption by the paper industry for 1981 is expected to be in the neighborhood of 140,000 tons, compared with 133,000 tons in 1980. Other major applications are: plastics, coatings, and refractories. Usage in the nonpaper-coating areas is substantially greater, but mainly comprises the less-costly coarser-ground material.

Sources: Producers are listed in the P&P Buyers Guide 1982, "Register of coating and filler pigments."

Availability: 1981, market; 1980, market; 1979, market.

Pricing: Precipitated: 1981—$95-$140/ton, f.o.b. works; 1980, $105-$135/ton; 1979, $98-$123/ton; 1978, $95-$133/ton. Ground, medium: 1981, $95-$100/ton, f.o.b. works; 1980, $90-$95/ton; 1979, $82-$83/ton; 1978, $66-$76/ton. (For further information see P&P, May 1981, p. 155.)

Forecast: Ultrafine ground calcium carbonates are finding increased usage as a coating pigment and are replacing some titanium dioxide as well as precipitated grades. The price of precipitated carbonate only rose about 3% to 4% this year and is forecast to increase the same in 1982. Ground $CaCO_3$, on the other hand, increased about 5% in price and is expected to go up about 8% next year.

Caustic soda

Uses: Most of the caustic (sodium hydroxide) consumed by the pulp and paper industry is used by kraft and bleached sulfite mills, mainly for caustic extraction. Kraft and semichemical (NSSC) mills also employ some caustic for sodium oxide makeup. Organic and inorganic chemicals production, textiles, and aluminum processing are other important uses.

Demand: Pulp mills account for about 17% of the total demand of some 13.5 million tons. Organic and inorganic chemicals together use more than 50% of the total,

while textiles and aluminum processing each employ about 6%.

Sources: Caustic soda is a coproduct of chlorine production. See chlorine profile for major producers.

Availability: 1981, very tight to tight; 1980, very tight; 1979, market; 1978, market.

Pricing: 1981, $270-$320/ton, 50% solution, f.o.b. works, freight-equalized; 1980, $167-$200/ton; 1979, $130-$160/ton; 1978, $160-$170/ton.

Forecast: The slight easing in caustic supply problems that occured in the third quarter was directly attributable to the increased demand for chlorine, sparked by improvements in the housing and automotive sectors. The tight market will ease next year, provided that the predictions for a substantial upsurge in the housing industry come to pass. By the end of the year, close to 110,000 tons of caustic will have been added to the merchant market as a result of BF Goodrich's new chloralkali and ethylene dichloride (EDC) facility in Convent, La. Vulcan, itself, is expanding the Wichita, Kan., plant by 40% by adding a new 200-tpd chlorine unit, scheduled for onstream operation in mid-1983. A portion of the chlorine will be employed captively to produce high-quality hydrochloric acid (HCl capacity is 70,000 tpy). Alcoa's refurbished 398-tpd caustic plant is slated for startup in Texas early next year.

Chlorine

Uses: The major use for chlorine in the pulp and paper industry is as a bleaching agent in both kraft and sulfite pulp mills. Small quantities of chlorine are also employed for on-site manufacture of calcium or sodium hypochlorite used with chemical or mechanical pulps.

Demand: Between 12% and 13% of total chlorine demand is purchased by the pulp and paper industry. In 1981 it is estimated that between 12 and 13 million tons will be consumed domestically in all applications, compared with the 11 to 12 million tons in 1980. Other major outlets include ethylene dichloride (EDC)—the intermediate for vinyl chloride monomer (VCM) manufacture—both inorganic and organic chemicals, and municipal and industrial water treatment. Manufacture of EDC accounts for about 21% of the total.

Sources: The advent of Convent Chemical on the chloralkali scene will be balanced somewhat by the withdrawal of BASF Wyandotte from chlorine/caustic manufacture (in 1983). This will leave approximately 25 chloralkali producers in the country making chlorine and caustic together by the electrolytic reduction of brine. Major producers include Dow Chemical, PPG Industries, Diamond Shamrock, Hooker Chemicals, Olin, Georgia-Pacific, Vulcan Materials, and Pennwalt.

Availability: 1981, market; 1980, market; 1979, tight to very tight; 1978, market.

Pricing: 1981, $145/ton, f.o.b. works, freight-equalized; 1980, $145/ton; 1979, $135-$150/ton; 1978, $135-$145/ton. Although the list price for chlorine has been at the $145/ton level since last year (and is not expected to be changed until 1982), actual selling prices have ranged from $80-$110/ton. Most of the industry instituted a $10/ton boost on the off-list price, slated to take effect on July 1. However, the increase did not hold, either due to the fact that some producers rescinded the increase or because of the issuing of a temporary competitive allowance (TCA) of the same magnitude. Recently, another attempt was made to hike the off-list prices, when at least two of the major producers announced a $15/ton and $20/ton hike (Dow Chemical and Diamond Shamrock, respectively) to take effect on October 1. Unless the hoped for recovery in the chlorine market is realized, it is likely this second attempt at a price hike will also fail.

Forecast: Chlorine demand was expected to strengthen in the second half of the year, after a depressed first half, but the recovery has been slower than anticipated. In the longer term, a more buoyant economy, together with increased demand for PVC—the key downstream product (via EDC) for chlorine—will allow the chloralkali producers to increase their operating rates. However, pulp and paper industry usage of chlorine may well decrease under pressure of continued ClO_2 substitution.

Hydrogen peroxide

Uses: Traditionally used in the pulp and paper industry, primarily as a bleaching agent for chemical and mechanical pulps, hydrogen peroxide (H_2O_2) is finding increased applications in the deinking of recycled newspaper stock.

Demand: Out of a total consumption last year of close to 123,000 tons, almost 18% (22,000 tons) was consumed by the pulp and paper industry. In 1981, usage by the industry should be in the neighborhood of 23,500 tons. The largest end-use for the peroxide is as a chemical intermediate; others include textiles, water and waste treatment, and mining application.

Sources: There are now four producers in the U.S., since Shell closed its Norco, La., plant in the first quarter of 1980. E.I. duPont and FMC expanded their facilities in 1980, while Interox America brought its grassroots plant in Deer Park, Texas, on-stream in late 1979. PPG operates a small facility in Ohio.

Availability: 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1981, 35.6¢-39.5¢/lb, 70% solution, f.o.b. producing point, freight equalized; 1980, 35.5¢-36.5¢/lb; 1979, 32.5¢/lb; 1978, 28¢/lb.

Forecast: H_2O_2 demand is expected to increase 8% to 10% annually through the middle of the decade. Increased usage of recycled newsprint will result in greater demand for the peroxide in deinking processes, while in-situ uranium mining and treatment of waste steam from West Coast geothermal energy production are becoming significant end-use areas, already accounting for at least 5000 tpy each.

Kaolin clay

Uses: Kaolin clays are employed in a wide range of paper and board grades as both fillers and coating pigments. The latter application accounts for about 54% of industry usage.

Demand: An estimated 3 million tons of kaolin is used annually by the paper industry, about 75% of total kaolin consumption. Approximate usage by grades: Nos. 1 and 2, 24%; water-washed, 22%; Nos. 3 and 4, 16%; delaminated, 13%; high-brightness and air-float, 10% each; and other, 5%. The ceramics industry accounts for about 20% of total consumption, while miscellaneous applications (paints and rubber, for example) hold the remaining 5%.

Sources: Producers are listed in P&P's Buyers Guide 1982, "Register of coating and filler pigments."

Availability: 1981, market; 1980, market; 1979, market to tight. Demand is generally high for high-quality grades, particularly water-washed clays.

Pricing: Premium No. 1 coating: 1981, $130/ton, f.o.b. Georgia; 1980, $118/ton; 1979, $108/ton; 1978, $98/ton. Water-washed No. 1 coating: 1981, $91.50/ton (same basis); 1980, $84/ton; 1979, $76/ton; 1978, $61.50/ton. Dry-ground filler grade: 1981, $56/ton

(same basis); 1980, $51/ton; 1979, $35-$44/ton; 1978, $30-$35/ton. (For further information, see P&P, May 1981, p. 155.)

Forecast: The coated paper market has been operating well to date with coated two-side grade production up 7.2% through August. It is not forecast to drop significantly through the rest of 1981 and into 1982, thus keeping demand for kaolin grades at a level comparable to last year.

Lime

Uses: The kraft mill operator requires a low-cost alkali to causticize the sodium carbonate in the green liquor. Lime, being the cheapest alkali available (between 2¢-3¢/lb), is therefore basic to the soda/lime route to free caustic. Kraft mills produce reburned lime on-site.

Demand: The U.S. pulp and paper industry accounts for about 5% of total lime consumption, which last year was about 19.5 million tons, down from the estimated 21 million tons required in 1979. Continuing lag in the construction and steel industries in 1981 will probably result in little growth, if any, for lime consumption. Major lime end uses: steel (37%); environmental applications (20%); chemicals, and sugar refining.

Sources: Included among the major manufacturers of lime, produced mainly from calcite ($CaCO_3$) or dolomite ($CaCO_3MgCO_3$), are Allied, Bethlehem Steel, Diamond Shamrock, Flintkote, Marblehead Lime, Martin Marietta Chems, Mississippi Lime, Pfizer, Steetley Industries, and U.S. Gypsum. Steetley purchased the Tacoma, Wash., plant of Domtar Industries earlier this year.

Availability: 1981, market; 1980, market; 1979, tight in eastern U.S., market in West; 1978, market to tight.

Pricing: Quicklime: 1981, $51.63/ton, f.o.b. plant; 1980, $46.10/ton; 1979, $41.16/ton; 1978, $36.75/ton.

Forecast: Next year should see some improvements in construction and steel which will most likely bring demand back close to the level prevailing in 1979.

Polyvinyl alcohol

Uses: Polyvinyl alcohol (PVA) is employed by the paper industry primarily as a surface size for printing and writing grades, but is also used to some extent in paper coatings.

Demand: About 12% of the total PVA produced is consumed by the paper industry. Production in 1981 is expected to reach the 127-million-lb level (excluding that required in the manufacture of polyvinyl butyral (PVB), down about 9.5% from the estimated 140.5 million lb produced last year. (Output in 1980 was also under that for the previous year by about 5%). Imports are currently running at a 23-million-lb/year rate, slightly under the 21 million lb reported for 1980. The largest end-use for PVA is by the textile industry (warp sizing), while adhesives and emulsifiers account for 25% and 12%, respectively.

Sources: PVA, derived from the hydrolysis of polyvinyl acetate, is produced domestically by three firms: Air Products & Chemicals, duPont, and Monsanto. Air Products makes both partially and fully hydrolyzed grades, duPont makes only the fully hydrolyzed product, while Monsanto produces only partially hydrolyzed PVA. However, duPont has announced it will expand capacity at its Houston, Texas, plant by 50% in 1984 and will also produce partially hydrolyzed PVA at that time.

Availability: 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1981, $1.00-$1.05/lb, f.o.b. plant; 1980, 86.5¢-91.5¢/lb; 1979, 77.5¢/lb; 1978, 69.5¢/lb.

Forecast: The PVA market is expected to grow an average of 6.5%/year to mid-decade, excluding PVB uses. However, an annual growth of only 4% is predicted, if PVB demand is included.

Saltcake

Uses: Saltcake (sodium sulfate) is the main source of makeup sodium and sulfur values in kraft mills.

Demand: Kraft pulp mills use slightly more than 50% of the estimated 1.3 million tons of sodium sulfate produced annually. Besides small quantities used as a textile mordant and in animal feeds, the balance of the sulfate produced is mainly consumed by the detergent and glass industries.

Sources: Equal quantities of sodium sulfate are produced from both natural deposits or as a byproduct in the manufacture of rayon, sodium bichromate, and hydrochloric acid. The product grade is dependent on the process employed. Major producers include Allied, Akzona, Avtex, Climax Chemical, Diamond Shamrock, Great Salt Lake, Kerr-McGee, Koppers, Morton, and Ozark-Mahoning. In addition to domestic supply, significant quantities of sulfate are imported from the Canadian Prairies. Shipments from Canada in 1981 are expected to be only slightly ahead of last year, when imports were 25% higher than in 1979.

Availability: 1981, market; 1980, tight to market; 1979, market to tight; 1978, market.

Pricing: 1981, $68-$79/ton, f.o.b. plant; 1980, $60-$68/ton; 1979, $47-$52/ton; 1978, $35-$45/ton. Prices are regional, being slightly lower on the West Coast.

Forecast: Demand for saltcake has dropped under pressure of the economic downturn. In the immediate future, it is expected that there will be increased requirements for saltcake as mill operating rates go up. However, over the long term, usage by the pulp mills will be directly dependent on the extent to which mills opt for chlorine dioxide replacement in the first bleaching stage. Mills operating a ClO_2 generator can use the sodium and sulfur values contained in the effluent to replace purchased saltcake.

Sodium chlorate

Uses: Most of the sodium chlorate produced is employed by pulp mills to generate chlorine dioxide (ClO_2) on-site.

Demand: In 1980, about 90% of the estimated 500,000 tons of sodium chlorate produced was used to generate ClO_2. Uranium processing accounted for 5%, while chlorate salt manufacture and agricultural applications took the remaining 5%.

Sources: Principal U.S. producers of sodium chlorate—derived from the electrolysis of an acidified sodium chloride solution—include ERCO Industries, Hooker Chemical, Huron Chemicals, Georgia-Pacific, Kerr-McGee, Olin, Pacific Engineering, and Pennwalt.

Availability: 1981, market; 1980, market; 1979, market; 1978, tight.

Pricing: 1981, $375/ton, f.o.b. works, freight equalized (Northeast); 1980, $345-$375/ton; 1979, $335-$345/ton; 1978, $345/ton. Prices in the southern states were slightly higher in 1981, ranging from $405-$420/ton. A $20/ton hike slated for the beginning of the third quarter was subsequently rescinded, but it is anticipated that there will be another attempt to institute the in-

crease in the fourth quarter.

Forecast: The swing to chlorine dioxide bleaching is expected to significantly increase the 7%/year growth in sodium chlorate demand. Olin and Huron Chemical have formed a joint-venture company—HO Process—to provide on-site bleach chemical plants at pulp mills in the U.S. The first on-site facility is targeted for completion next year.

Sodium hydrosulfite

Uses: Sodium hydrosulfite is used as a bleaching agent for mechanical and deinked pulps, either as a proprietary blend or from in-situ generation at the mill from sodium borohydride (Borol).

Demand: U.S. consumption this year is estimated at about 55,000 tons, excluding in-situ hydrosulfite produced via the Borol route. 20% of this total was accounted for by pulp bleaching. The largest end-use for sodium hydrosulfite is in vat dyeing (60%), while miscellaneous applications and exports each hold about 10% of the total.

Sources: There are three producers of sodium hydrosulfite—Olin, Royce Chemical, and Virginia Chemicals. Borol is produced by Thiokol's Ventron Div.

Availability: 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1981, 52¢/lb (proprietary blends), f.o.b. producing point; 1980, 49¢/lb; 1979, $47¢/lb; 1978, 45.5¢/lb.

Forecast: The continuing growth in TMP pulping and newsprint recycling will help to increase the demand for hydrosulfite in the pulp and paper industry. However, the proprietary blends will continue to meet competition from Borol, although in some cases mills are beginning to use a combination of the two brighteners.

Starch

Uses: Corn, wheat, tapioca, or potato starches are the workhorse binders for the coating mills, and are also employed as surface sizes and internal additives. Starch is employed, as well, in adhesive applications for corrugated containers.

Demand: Total consumption this year is estimated at between 4 and 5 billion lb; 3 billion lb will be used for paper and board. An estimated 2.8 billion lb were used by the paper industry in 1980. Other major end-uses: food, brewing, and textiles.

Sources: 90% of the starch used by the paper industry is cornstarch. A listing of producers appears in P&P, Buyers Guide 1981, pp. 32-43.

Availability: Unmodified, 1981, market; 1980, market; 1979, market. Modified, 1981, tight to market; 1980, tight, 1979, tight to market.

Pricing: Unmodified, 1981, $12.25/100 lb, f.o.b. plant; 1980, $9.50-$10.50/100 lb; 1979, $9-$10/100 lb; 1978, $8/100 lb. Modified starch prices vary for each grade, but generally follow price trends of unmodified starch.

Forecast: Unmodified starch markets may conceivably become tighter as the demand for high-fructose corn syrup (HFCS) continues to increase, particularly by the soft drink industry. A couple of the cornstarch producers have recently expanded their HFCS capacities. A.E. Staley increased its HFCS capacity from 1.3 to 2.3 billion lb/year, while Amalgamaize (a joint venture of American Maize and Amalgamated Sugar) brought onstream in mid-summer a 55% expansion at its Alabama plant, bringing HFCS capacity to 55 million lb/year. Last year, CPC closed a plant in Texas and converted an Illinois facility to gasohol; but the loss in starch capacity was offset by expansions at Cargill and National Starch which totalled some 80 million lb/year. There should be no shortage of corn, since a record crop has been reported for this year. This large corn crop will help keep price increases below the 20% rise experienced in 1980; and a 15% hike for 1981 is forecast.

Styrene-butadiene latex

Uses: The bulk (about 90%) of the styrene-butadiene (SB) latex employed by the paper industry is used as a coating binder, the remaining 10% being for paper saturation (wallpaper, for example).

Demand: About 38% of the estimated 585 million lb of SB latex consumed in the U.S. last year was used by the paper industry. The major end application (50%) is in carpetbacking and integral foam. The remaining 12% is divided among other textile applications and adhesives.

Sources: At least two-thirds of the estimated 915 million lb of annual capacity in the U.S. is held by three major suppliers: Dow Chemical, Reichhold, and General Tire (in descending order of nameplate). A host of smaller firms make less than 100 lb/year. A complete listing of producers appears in P&P Buyers Guide 1981, pp. 32-43.

Availability: 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1981, 65¢-75¢/lb, delivered; 1980, 59¢/lb; 1979, 53¢/lb; 1978, 40¢-43¢/lb.

Forecast: In the last couple of years, the rising costs of petrochemical feedstocks have hampered the efforts by the SB latex compounders to replace part or all of the starch binder used in papercoating. Both styrene and butadiene (the precursors for SB latex) have risen sharply in price since the beginning of last year, although there are signs that the price of styrene monomer is beginning to move downwards. At the end of the third quarter, styrene prices were reportedly being discounted at least 3¢/lb. Nevertheless, the increasing demand for lead-free gasoline will put additional pressures on the supply of aromatics such as benzene, one of the precursors for styrene monomer.

Sulfur

Uses: The bulk of the sulfur used by the pulp and paper industry is purchased by sulfite pulp mills, although some quantities are used directly in kraft pulp mills.

Demand: Pulp mills consume only a small fraction of the 10.8 million long tons (12 million short tons) of sulfur expected to be consumed in the U.S. this year. By far, the bulk of the sulfur purchased is for sulfuric acid and fertilizer production.

Sources: Between 53% to 55% of the elemental sulfur produced in the U.S. is via the Frasch route, the balance coming from refineries and sour natural gas production. Major Frasch producers are: Duval, Freeport Sulfur, and Texasgulf. More than 53 firms recover sulfur, the majors being Atlantic Richfield, Exxon, Getty, Mobil, Standard, Texaco, and Union Oil.

Availability: 1981, tight; 1980, tight; 1979, very tight; 1978, market to tight.

Pricing: 1981, $133.50/long ton, crude, bright, f.o.b. Gulf Coast ports; 1980, $105-$121/long ton; 1979,

$71.75/long ton; 1978, $62.50/long ton. U.S.-recovered sulfur is quoted $15-$20/ton below Frasch levels. Currently, Canadian recovered sulfur is being listed at between US$75-$80/long ton, f.o.b. Alberta producing points.

Forecast: New capacity that came on-stream in the 1980-81 period has slightly eased the tight sulfur supply situation, which had been partially relieved by weak summer demand from the fertilizer industry. Duval and Freeport added 373,000 long tons of capacity last year to their Frasch operations, while Mobil, Pursue Gas Processing & Petrochemical, and Shell increased their recovered capacity by 751,000 long tons. This year, an additional 152,000 long tons of capacity came on-stream in the refinery and natural gas sectors. Prices for both recovered and Frasch sulfur are expected to increase at least 15% in 1982.

Titanium dioxide

Uses: Both rutile and anatase grades of titanium dioxide (TiO_2) are employed by the fine paper and board mills, as a filler and in coatings.

Demand: The paper industry will consume slightly more than 360 million lb of TiO_2 this year, with anatase grade comprising 75% of this. In 1980, industry consumption was an estimated 354 million lb. The U.S. consumes a total of about 810,000 tpy. The largest end-use being paints (51%), while plastics applications accounted for 12%. Paper and paperboard applications comprised 23% of the total.

Sources: About 75% of the TiO_2 produced in the U.S. is via the chloride route, the remaining 25% employing the sulfate process. Producers are listed in P&P Buyers Guide 1982, "Register of coating and filler pigments."

Availability: 1981, anatase/rutile, market; 1980, anatase/rutile, market; 1979, anatase, market; rutile, tight.

Pricing: 1981, anatase, 58¢-70¢/lb, delivered; rutile, 63¢-75¢/lb; 1980, anatase and rutile, 57¢/lb; 1979, anatase, 53¢/lb; rutile, 59¢/lb; 1978, anatase, 46¢/lb; rutile, 52¢/lb.

Forecast: TiO_2 demand has remained relatively firm, even though some of its major markets are weathering a severe recession in the construction industries. Paper and board demand is good and should improve in 1982. TiO_2 is under pressure from other replacement pigments, but these are not yet a serious threat to its position.

Other major chemicals

Acrylic binders: Supplies of acrylic coating binders are adequate this year, as was the case in 1980. Alkali swellable copolymer prices have gone up to 72.5¢/lb, f.o.b. producing point, and are expected to increase another 7% in 1982.

Alum: There is no shortage of aluminum sulfate this year, although the supply/demand balance has tightened slightly. A $10/ton boost was instituted in mid-summer, bringing the solution alum price to $133/ton in the North and $126/ton in the southern states. Further increases are anticipated in 1982, under pressure of rising raw material costs for sulfuric acid and alumina.

Casein: The price of industrial-grade casein has not risen since last year; it remains at $1.26/lb. It is, however, expected that 1982 will see at least a 12% increase.

Polyethylene: Extrusion-coating,low-density polyethylene was selling at the end of the third quarter for 45¢/lb, hoppercars, f.o.b. works, freight allowed. The increase from mid-year 1980 was only between 3% and 4%, but it is anticipated that next year's price increase will be between 6% and 7%.

Polyvinyl acetates: Polyvinyl acetate emulsions used by the paper industry are in good supply. However, prices are directly influenced by the oil sector since, like other synthetic binders, PVAc is petrochemically based and should experience increases of at least 10% in 1982.

Rosin sizes: Although supplies of tall-oil rosin were tight early this year, sales have strengthened; prices rose at the beginning of the second quarter from 32¢/lb to 38¢-41¢/lb. Rosin demand by the paper industry has been reduced by the penetration of synthetic sizes, although inks, adhesives, and coatings are maintaining strong demand for the rosin.

Soda ash: Solvay-process soda ash must compete with natural trona shipped from Wyoming. Costs of both mining and transport of trona are sensititve to energy prices, though the synthetic product is even more energy-intensive. Both types have therefore been experiencing escalating prices. The second boost this year, effective July 1, has brought natural trona to $92/ton, bulk, f.o.b. Wyoming, while Allied's product is now selling at $132/ton, bulk, f.o.b. Syracuse, N.Y. Both types rose $6/ton in the latest round of increases.

Wet-strength resins: Also petrochemically based, urea-formaldehyde and melamine-formaldehyde resins continue to escalate in price as the price of methanol continues to rise. (Methanol is the precursor for formaldehyde.) At least a 10% boost is expected again for next year.

Survey of chemical supply for the pulp and paper industry in Canada

☐ Prices in Canada have also been escalating, under pressure from double-digit inflation, compared with last year (see Figure 3). Nevertheless, the percent increase in prices for pulp and paper products for the January-July period was actually less than was the case at the end of the first quarter. The most significant development, however, is the huge jump in the petroleum and coal products index, which will lead to substantial price increases in petrochemical-base products.

Specifically affected will be the synthetic binders and sizes, such as styrene-butadiene latexes and acrylic and polyvinyl acetate emulsions. Wet-strength additives (such as polyamide-epichlorohydrin) and surface sizes are also based on petrochemical precursors, as are dry-strength additives like polyacrylamides.

The new agreement signed in September between the Alberta and federal governments will considerably exacerbate the situation over the next five years. Beginning January 1, 1982, the wellhead price of old oil will rise to $23.50/bbl (from $19.75), but new oil (oil discovered

after December 1, 1981) will jump almost 150% from the same base to $49.52/bbl. Prices will continue to rise at least $4.50/bbl/year for old oil, while the new-oil wellhead price is to reach $77.48/bbl by July 1, 1986.

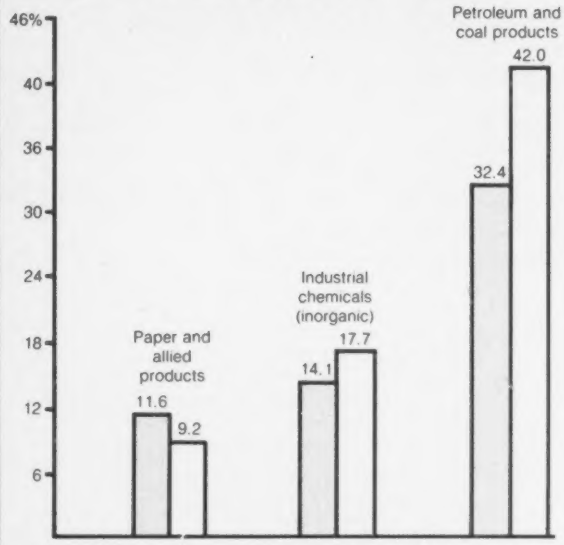
However, costs of most chemicals (whether petrochemical base or not) will continue to rise next year, led by the expected 30% hike in caustic prices (see Figure 4). Over the past year or so, the caustic market has experienced shortages which resulted in the major producers placing their customers on allocation at the beginning of 1981. With demand down somewhat because of the disruptions in the western mills, allocation percentages may be eased by year-end. The chloralkali producers are still hampered by lack of chlorine markets.

Sulfur is the other commodity besides caustic that has been in a tight supply situation, which should ease somewhat this year. Exports to the U.S. have continued to grow, reaching 1.58 million tons in 1980, up from 1.4 million tons in the previous year. For 1981, sulfur shipments to the U.S. are estimated to be 1.65 million tons.

Another chemical that has been exhibiting good growth over the past couple of years—and is expected to maintain that rate over the foreseeable future—is sodium chlorate. Domestic capacity is growing by leaps and bounds, a substantial portion of which is earmarked for export shipments in the northeast U.S. Exports of chlorate have not been that large for the past two or three years, only about 38,500 tons going south in 1980. The same amount is expected to be shipped in 1981. Without the additional capacity (40,000 tons) coming on-stream in 1983 in the east, exports for mid-decade have been pegged at about 44,000 tons.

Total pulp capacity is expected to increase at least 10% by 1983, while newsprint capacity is predicted to grow by 15% during the same time. However, since U.S. newsprint capacity is forecast to increase 20% in the 1980-83 period, shipments of Canadian newsprint across the border will begin to slow down. Operating rates of the Canadian mills have already dropped slightly, averaging 95% for the first seven months (before the B.C. strike) compared with 97% in 1979.

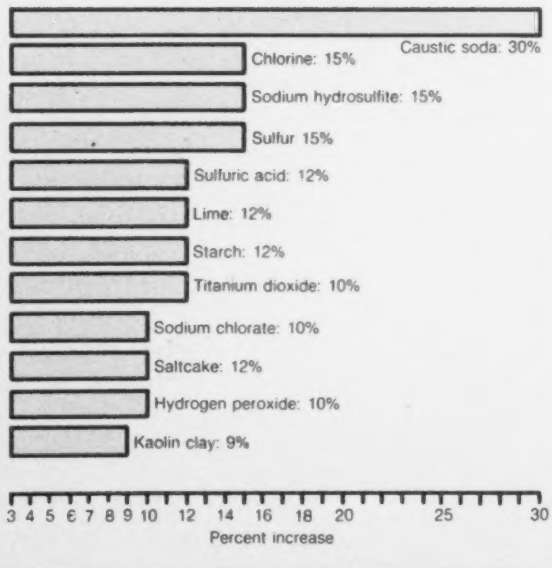
Figure 3. **Canadian price increases for 1981***



* Shaded column shows price increases for first three months of 1981; unshaded data is for first seven months of this year.

Source: Statistics Canada, Industrial Prices Div.

Figure 4. **Projected price increases for major chemicals in 1982**



Aluminum sulfate

Uses: The Canadian pulp and paper industry consumes about 60% of the total aluminum sulfate produced in the country. Slightly better than 50% of the alum going to the mills is employed in the precipitation of rosin size, the balance being used for pitch control and process water treatment.

Demand: In 1980, an estimated 55,000 tons of alum were used for internal paper sizing; this will increase slightly in 1981 to 56,000 tons. Total alum consumption in 1980 was an estimated 178,500 tons and is expected to rise slightly to 183,000 tons for 1981. Municipal water and sewage treatment account for 30% of total alum usage, the balance going into pigments, cellulose insulation, and other miscellaneous applications.

Sources: There are two major Canadian alum producers—Alcan Smelters & Chemicals and Allied Chemical Canada—and several smaller operations in western Canada, the largest being Inland Chemicals, a C-I-L subsidiary.

Availability: 1981, market; 1980, market; 1979, market to tight.

Pricing: 1981, $111-$132/metric ton ($100.70-$119.75/short ton), liquid, f.o.b. Valleyfield, Que.; 1980, $86-$111/ton; 1979, $79-$86/ton.

Forecast: There was only one price hike this year (19% in the March/April period) for aluminum sulfate. This contrasted sharply with alum's price performance last year when two boosts within a three-month period increased prices about 27.5%. However, further price increases this year are unlikely. Demand for alum in both the pulp and paper and the water treatment sectors has been growing only 2% to 3%/year over the past couple of years. Strikes last year at Abitibi and Domtar cut alum consumption. In addition, the use of more TMP in newsprint furnish has allowed some mills to cut back on their alum needs.

Caustic soda

Uses: Pulp mills, which consume the largest share of the caustic soda produced, employ the sodium hydroxide in the extraction stages of kraft bleach plants, for hypochlorite makeup and in sulfite pulping.

Demand: The pulp mills were expected to use about 1.1 million tons of caustic in 1981, compared with the slightly more than 1 million tons employed last year. However, the six-week strike in western Canada will result in lower consumption. The pulp and paper industry normally accounts for almost 65% of the total caustic consumed. The next-largest end uses are in the production of propylene oxide and alumina, which take about 6.5% each. Other uses include detergents and cleaners, organic and inorganic chemicals, petroleum refining, food and textile processing, and cellulose film.

Sources: Caustic, a coproduct of chlorine production, is made by about nine firms in Canada. The major producers are listed in the chlorine section.

Availability: 1981, very tight to tight; 1980, very tight; 1979, tight; 1978, tight.

Pricing: 1981, $293-$381*/ton, 50% solution, bulk, f.o.b. works, freight equalized; 1980, $195-$293/ton; 1979, $183-$195/ton; 1978, $175-$183/ton. (*Effective Oct. 1; no further hikes expected in 1981.)

Forecast: The supply of caustic is forecast to tighten up again next year. It is possible that the increased price of caustic, compared with the relatively steady price of soda ash, might lead to a switch back to the carbonate by some of the sulfite mills who opted for caustic a couple of years ago. But, demand for caustic by kraft mill bleach plants will continue to account for most consumption increase over the next three or four years.

Chlorine

Uses: Chlorine's major use is as a bleaching agent in kraft and sulfite pulp mills, although the growing trend to chlorine-dioxide substitution in the first bleaching stage is threatening its dominant position in the bleach plant.

Demand: The percentage share of the Canadian pulp and paper industry's use of chlorine has declined over the last three years. From a high of 60% in 1978, it dropped to about 45% of the estimated 1.3 million tons domestic demand in 1980. For 1981, the industry's share was predicted to decrease slightly to 43%, but it could be somewhat less because of the decreased consumption on the west coast due to the strike. The next-largest end-use for chlorine is in the production of ethylene dichloride (EDC), the precursor of polyvinyl chloride (PVC), whose share has grown substantially over the last two years from 15% to about 31.5% in 1980. Organic and inorganic chemicals account for most of the balance.

Sources: Chlorine is produced along with caustic by the electrolytic reduction of brine, an energy-intensive process. The major chloralkali producers include C-I-L, Canadian Occidental Petroleum, Dow Chemical Canada, FMC Chemicals, and Stanchem.

Availability: 1981, market; 1980, market; 1979, tight; 1978, tight.

Pricing: 1981, $225-$254*/ton, bulk, f.o.b. works; 1980, $195-$225/ton; 1979, $163-$195/ton; 1978, $145-$165/ton. (*Effective Oct. 1.)

Forecast: The inroads of ClO_2 in the first bleaching stage will, no doubt, increase over the next several years. However, the amount of chlorine displaced may change. Thus, although overall chlorine demand may increase an average of 4%/year to mid-decade, usage by the mills could grow modestly.

Hydrogen peroxide

Uses: Hydrogen peroxide (H_2O_2) is employed by the pulp and paper industry as a bleaching agent for mechanical and chemical pulps. Other uses include textile bleaching and water treatment. A new use in a pulp mill is currently being tested and involves the addition of small quantities to the first extraction stage to reduce the color of the bleach plant effluent.

Demand: In 1979, the 3400 tons of H_2O_2 used for pulp bleaching comprised 60% of the total peroxide consumption. This had grown to 5000 tons and 68.5% of the total last year. It is estimated that about 5700 tons will be employed by the mills in 1981. Textile applications in 1980 accounted for 10.5% of total usage, while water treatment took about 6%. The balance went into miscellaneous end uses. Since C-I-L and DuPont Canada closed their small domestic plants several years ago, all peroxide consumed in Canada has been imported, mostly from the U.S.

Sources: The major importers are C-I-L and DuPont, which bring in product from FMC and E.I. DuPont respectively. Interox America also ships in some peroxide on a direct basis, and various distributors import from European sources.

Availability: 1981, market; 1980, market to tight; 1979, market; 1978, market.

Pricing: 1981, 38¢-42¢/lb, bulk, 50% solution, f.o.b. Toronto; 1980, 35¢-38¢/lb; 1979, 33¢-35¢/lb; 1978, 29¢-33¢/lb.

Forecast: The fortunes of hydrogen peroxide in the pulp and paper industry have been reversed since the mid-70s. Due to more use of TMP, H_2O_2 usage has been growing at an average annual rate of more than 50% from 1977-80. It is expected that over the next four to five years the annual growth in consumption will average about 11%/year.

Hydrosulfites, borohydride solution

Uses: Practically all newsprint mills bleach groundwood with hydrosulfite. An alternative to purchased sodium hydrosulfite (either unblended or as proprietary blends), Borol is employed by many mills to generate sodium hydrosulfite in situ.

Demand: In 1980, the pulp and paper industry used an estimated 9500 tons of sodium hydrosulfite as such, and an additional 11,000 tons of Borol (on a 12% active borohydride basis). The other end use for sodium hydrosulfite, vat dyeing of cotton, accounted for about 12% of the total consumed.

Sources: No sodium hydrosulfite has been produced in Canada for several years. VirChem of Canada imports blended hydrosulfites from its U.S. parent, Virginia Chemicals (recently acquired by Celanese), while various distributors bring in product from Europe. Borol is shipped in exclusively by the Ventron Div. of Thiokol.

Availability: Hydrosulfite blends: 1981, market; 1980, market; 1979, market. Borol: 1981, market; 1980, market; 1979, market.

Pricing: Blended: 1981, 59¢-64¢/lb, delivered, eastern Canada; 1980, 51.4¢/lb; 1979, 50.5¢/lb. Nonblended: 1981, 66.4¢-71.5¢/lb; 1980, 56¢-66.4¢/lb; 1979, 47.5¢-56¢/lb.

Forecast: Higher brightness-level requirements and the growing acceptance of TMP will result in greater usage of both sodium hydrosulfite and borohydride. Sodium hydrosulfite demand is expected to increase about 5%/year to mid-decade, while Borol's annual consumption should increase about 10% (on the average) during the same period.

Kaolin clay

Uses: Kaolin clay is used as a filler and in coating paper and board, with 59% consumed in filler applications.

Demand: Total kaolin consumption has been dropping off since 1979, when kaolin imports jumped more than 110,000 tons from the previous year. Last year, 280,500 tons were imported, down somewhat from the 301,500 tons reported for 1979. However, total consumption in 1979 and 1980 was 271,000 and 259,000 tons, respectively, with inventories accounting for the difference. About 87% of total usage is accounted for by the paper industry, the balance going into ceramics, paint and varnish, rubber and linoleum, and miscellaneous applications.

Sources: U.S. suppliers are listed in P&P Buyers Guide 1982, "Register of coating and filler pigments." The balance of the imports comes from English China Clays of the U.K.

Availability: 1981, market; 1980, market; 1979, market to tight.

Pricing: Water-washed No. 1 coating grade: 1981, US$215-$218/ton, f.o.b. Georgia; 1980, $208-$215/ton; 1979, $194-$208/ton. Dry-ground, air-floated, filler grade: 1981, $47-$58/ton (same basis); 1980, $43-$47/ton; 1979, $35-$43/ton.

Forecast: Labor strife last year in eastern Canada resulted in a slight downturn in coating-grade kaolin use with an estimated 91,500 tons consumed. The strikes at some eastern mills continued into the second quarter of this year; and in July, strikes in the British Columbia forest industry occurred. Consumption this year will, therefore, be somewhat less than the 88,000 tons originally predicted at the beginning of the second quarter.

Lime

Uses: 30 kraft mills purchase lime to supply supplementary calcium requirements.

Demand: Pulp mills accounted for 228,000 tons (11%) of the estimated 2 million tons of lime consumed domestically in 1980. Iron and steel mills are the largest consumers and accounted for more than 680,000 tons (31%) last year. In descending order of magnitude, other lime uses include industrial chemicals, uranium recovery, nonferrous smelters, water and sewage treatment, and sugar refining.

Sources: The lime industry is composed of about eight major merchant producers and a host of smaller firms. Some captive operations, such as that of the Steel Co. of Canada, are also large. Based on nameplate capacity, the three major producers are Domtar, Steel Brothers of Canada, and BeachviLime, although the latter firm also has a captive steel company customer. Because of the low cost of the lime, transportation costs—which continue to escalate—have determined that the location of most lime plants be generally close to the consumers.

Availability: 1981, market; 1980, market; 1979, tight to market; 1978, market.

Pricing: Quicklime: 1981, $46-$51/ton, bulk, f.o.b. plant; 1980, $40.98-$46/ton; 1979, $34.98/ton; 1978, $32.48-$34.98/ton.

Forecast: In the last couple of years, the annual growth of the overall lime market dropped to about 2% from the prevailing 4% in the 1977-79 period. Operating rates last year were about 66% based on rated capacity. However, actual capacity is somewhat less than this and the effective operating rate was close to 90%. Despite the drop in annual growth, there should be more than 600,000 tons of nameplate capacity added before the middle of the decade. Steel Brothers, for one, installed a second kiln at its Kamloops, B.C., plant this past summer, which will more than double its previous nameplate capacity of 110,000 tons.

Saltcake

Uses: The largest outlet for sodium sulfate (saltcake) is the kraft pulp mill, followed by usage in the detergent industry.

Demand: Pulp mills account for about 82% of the total domestic demand for sodium sulfate. The detergent industry accounts for some 12% of the total, while the balance (6%) goes into glass, animal feeds, textiles, and other miscellaneous applications. Last year, exports to the U.S. rose to 271,000 tons—up more than 27% from the previous year.

Sources: Unlike the situation in the U.S., byproduct sodium sulfate capacity is only about 11% of the total, the bulk of the sulfate originating in the Glauber's salt deposits in Alberta and Saskatchewan. The major producers include Alberta Sulfate, Francan Minerals, Midwest Chemicals, Ormiston Mining & Smelting, and Saskatchewan Minerals. Sybouts Sodium Sulfate closed its facility last year for economic reasons. In eastern Canada, the two byproduct sulfate producers are Ontario Paper and Courtaulds.

Availability: 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1981, $55-$70/ton, bulk saltcake, f.o.b. works; 1980, $50-$55/ton; 1979, $50/ton; 1978, $45-$50/ton.

Forecast: The demand for saltcake by kraft pulp mills has firmed up over the last couple of years. This is in part due to the shortage of caustic, resulting in some mills replacing their caustic requirements with saltcake. However, in the long term, the trend is towards more mills recycling the effluent from their chlorine-dioxide generators, which contain sodium and sulfur values.

Sodium chlorate

Uses: Sodium chlorate is produced mainly for use in chlorine dioxide generators, although it is a powerful oxidizing agent in its own right.

Demand: Last year, about 96% of the total chlorate consumption of 221,000 tons was used by the pulp mills. The balance is accounted for by uranium leaching, which is growing at a much higher rate than usage in the pulp and paper industry. Mill usage of about 230,000 tons had been predicted for 1981, but the western strike will probably reduce that amount by at least 10%.

Sources: The Canadian merchant producers of sodium chlorate are Canadian Occidental, Erco Industries, QueNord Chemicals, and Stanchem. The following firms are captive producers of the chlorate: B.C. Chemicals, Canso Chemicals, Huron Chemicals, St. Anne Chemical, and Saskatoon Chemicals.

Availability: 1981, market; 1980, market; 1979, market; 1978, tight.

Pricing: 1981, $305/ton, f.o.b. works, freight equalized; 1980, $310-$330/ton; 1979, $281-310/ton; 1978, $250-$281/ton.

Forecast: More than 75,000 tons of capacity have come on-stream since 1979. An additional 70,000 tons is slated for next year, while more than 50,000 tons will be coming on-stream between 1983-85. Canadian chlor-

ate capacity by mid-decade should surpass the 460,000-tpy mark.

Starch

Uses: Most of the starch (80%) consumed by the mills is in size press applications; some is used with styrene-butadiene latex systems for coating. A relatively small quantity is accounted for by wet end applications.

Demand: About 21% of the total starch consumed is used by the paper industry, which last year purchased an estimated 72,000 tons. The largest end use for starch is in the production of corn sweeteners, which last year accounted for 51% of total consumption. Other end uses include adhesives for corrugated boxes and miscellaneous applications, food starches, and ore flotation.

Sources: Most of the starch for the paper industry is derived from corn. The major cornstarch producers include Canada Starch, Nacan Products, St. Lawrence Starch, and Zymaize. Industrial Grain Products is a supplier of wheat starch.

Availability: Unmodified: 1981, market; 1980, market; 1979, market. Modified: 1981, market; 1980, market; 1979, market.

Pricing: 1981, native pearl, $19.25-$21.50/100-lb bags, f.o.b. Toronto/Montreal; 1980, $16.45-$19.25/100 lb; 1979, $14.45-$16.45/100 lb; 1978, $12.60-$14.59/100 lb. (Deduct $1/100 lb for bulk shipments.) Unmodified starch prices vary according to grade, and generally follow the price trend for modified starches.

Forecast: Although the corn used by the starch companies is grown domestically, price paid for the grain is strongly influenced by world corn prices. The size of the U.S. corn crop usually determines what the paper mills in Canada pay for their starch. Usage by the mills dropped last year because of the labor stoppages in eastern Canada; usage will decrease again this year because of the B.C. work cut. Over the long-term, purchases by the mills should increase, on the average, about 5%/year.

Sulfur

Uses: The sulfite pulp mills that do not purchase liquid sulfur dioxide burn sulfur to produce gaseous SO_2. Not all the SO_2 is used as makeup for sulfite or bisulfite cooking liquor; some is used for ClO_2 generation and other uses in the bleach plant.

Demand: Since 1978, the pulp and paper industry has relied primarily on domestic byproduct sulfur and, last year, used an estimated 309,000 tons (31%) out of a total sulfur consumption of about 1 million tons. The largest end use for sulfur is sulfuric acid (63.5%), while other applications include carbon disulfide production, rubber vulcanization, and other miscellaneous end uses.

Sources: Sulfur in Canada is recovered either from sour-gas operations or from petroleum refineries. Major producers include Amoco, Acquitaine, Canadian Occidental, Chevron Standard, Gulf Hudson's Bay Oil & Gas, Petrogas Processing, Shell, Texasgulf, and Westcoast Transmission.

Availability: 1981, tight to market; 1980, tight; 1979, tight.

Pricing: 1981, crushed, slate, or molten, $60-$75/long ton, f.o.b. producing point; 1980, $33-$60/long ton; 1979, $25-$30/long ton.

Forecast: The long-term outlook for sulfur usage in the pulp and paper industry is somewhat depressed. Some sulfite mills have switched to methanol (Solvay process) in place of SO_2 in the wake of the sulfur shortages in 1979 and early 1980. Also, additional sulfite mills are becoming obsolete and are under increasing cost pressures, and more may shut down. As a result, sulfur usage will not exceed 265,000 tons by 1983. (In the early 70s, mills were buying as much as 335,000 tpy).

Sulfuric acid

Uses: Sulfuric acid's major use in the kraft pulp mill is in the generation of chlorine dioxide.

Demand: Although pulp mills consume only 8% to 9% of the sulfuric acid consumed in Canada, as a customer group they are the second largest, after phosphoric acid manufacture (61.5%). Other end uses include agriculture chemicals, uranium ore processing, titanium dioxide, mining and smelting, organic chemicals, petroleum refining, soaps and detergents, cellulose film, and viscose rayon.

Sources: Major producers include Allied Chemical, Border Chemical, Cominco, Falconbridge Nickel, Inco Metals, Inland Chemicals, IMC, and Western Cooperative Fertilizers. C-I-L sold its Copper Cliff, Ont., operation to Inco in March of this year. Byproduct acid is made by several firms, and a few companies produce the acid for captive purposes.

Availability: 1981, tight to market; 1980, market to tight; 1979, tight to market; 1978, very tight.

Pricing: 1981, 66° Baume, $69.31-$77.79/ton, bulk, f.o.b. producing points, eastern Canada; 1980, $60.87-$69.31/ton; 1979, $52.40/-$60.87/ton.

Forecast: Over the long term, growth in sulfuric acid demand by the pulp and paper industry should equal the growth in output of bleached softwood market kraft pulp, which is expected to increase at about 4%/year for the 1980-84 period.

Titanium dioxide

Uses: Most of the anatase grade of TiO_2 used by the paper industry is employed by the fine paper mills (90%), the balance being used by paperboard producers.

Demand: The estimated 7200 tons used in 1980 by the paper industry comprised about 10% of the total TiO_2 consumption (over 72,000 tons). The largest use is by the paint industry (60%), while plastic applications accounted for 15%. Other end uses include rubber products and miscellaneous applications.

Sources: There are two domestic producers—NL Chem Canada (formerly called Canadian Titanium Pigments) and Tioxide of Canada—which, between them, have the capacity to produce 79,000 tpy of TiO_2 based on the sulfate process.

Availability: 1981, untreated anatase, market; 1980, market.

Pricing: 1981, $69-$74.50/100 lb, untreated anatase, delivered, bags; 1980, $59-$69/100 lb; 1979, $48.50-$59/100 lb. (Bulk slurry carries a 50¢/100-lb premium.)

Forecast: The longer-term TiO_2 market outlook is for modest growth overall at 2% to 3%/year. Plastics and rubber applications are expected to show better annual growth rates than either paper or paints. There is no real danger of any shortages developing, even though there are no plans for expansions on the agenda by either producer. □

British Columbia leads Canada in mill capacity expansion plans

☐ British Columbia woodpulp capacity will increase by 20.7%, while paper and board capacity is expected to rise 26.8% between 1980 and 1983, according to the just-released Canadian Pulp & Paper Assn. capacity survey. This is double that province's planned national rate of expansion. Canadian TMP will nearly triple in that period due to the current explosion in newsprint. Growth, in most paper grades other than newsprint, however, will be more modest.

Total Canadian pulp capacity will grow by 10.6% in that period. This 2.4-million-metric-tpy hike, to 22.5 million tpy, includes a jump to 3 million tpy (from 1.1 million tpy) in TMP capacity, and a 660,000-tpy market pulp increase to 7.9 million tpy. Bleached softwood kraft market pulp will grow by 8.3% to 5.3 million tpy, with Northwood Pulp & Timber Ltd.'s big Prince George, B.C., expansion the biggest factor. Mechanical market pulp capacity will explode with a 97.9% increase to 475,000 tpy due to a greenfield mill being built in Quesnel, B.C., by Quesnel River Pulp Co.

Dissolving and special alpha grades of market pulp will rise by only 45,000 tpy to 385,000 tpy as the result of modest expansions at three mills. Sulfite grades will fall slightly to 345,000 tpy, cut by the newsprint industry's switch to TMP.

Despite the current softness in hardwood pulp markets, Canadian capacity for bleached hardwood kraft pulp will edge up by 4.1% to 630,000 tpy, while unbleached kraft pulp will remain largely unchanged at 280,000 tpy. Semibleached softwood kraft pulp capacity will drop by 9.1% to 505,000 tpy.

Newsprint manufacturers are adding eight new machines between 1980 and 1983, resulting in a net capacity increase of 785,000 tpy. The installation of six twin-wire formers on existing machines will add another 225,000 tpy of newsprint capacity, while an additional 360,000 tpy will come from other improvements. The total projected increase of 1.37 million tpy will boost Canada's newsprint capacity to 10.5 million tpy (from 9.13 million tpy) by 1983.

Canadian newsprint and groundwood capacity figures are questioned by many observers, who note that Canadian definitions—and a reluctance to pay U.S. tariffs for groundwood paper—appear to understate Canadian groundwood specialties capacity by nearly 1 million tpy, while overstating newsprint capacity by an equal amount. CPPA lists two new groundwood specialties machines and one conversion of a newsprint machine to groundwood specialties, bringing on 205,000 tpy and increasing that category to 865,000 tpy by 1983.

The only other paper grades showing any significant rise are book, writing, and miscellaneous fine papers. These grades are expected to increase by 15.1% to 1 million tpy due to expansions planned by MacMillan Bloedel Ltd. and Great Lakes Forest Products, and a 16.3% increase in tissue capacity to 464,000 tpy. Dominion Cellulose's new 30,000-tpy tissue machine represents the largest growth in tissue capacity.

Kraft paper capacity will be flat in the 1980-to-1983 period, dropping 1.8% to 552,000 tpy. Special papers capacity, which includes tissue other than sanitary, greaseproof, and glassine, will be virtually unchanged at 37,000 tpy.

Containerboard capacity will remain almost flat, rising only 95,000 tpy to 1.9 million tpy. Kraft linerboard capacity will edge up 4.4% to 1 million tpy, and semichemical corrugating-medium capacity will see a growth of 3% to 510,000 tpy. Recycled linerboard will jump by 11.4% to 292,000 tpy, however.

Boxboard capacity will rise by 3.2% to 833,000 tpy. This is largely on the strength of a 26,000-tpy increase in folding boxboard other than solid bleached board. Building paper and board capacity, including wet machine board, will remain largely stable, reaching 745,000 tpy in 1983.

Many major projects recently announced by Canadian companies were not included in the survey. Among the unlisted projects were British Columbia Forest Products Ltd.'s 160,000-tpy newsprint machine planned for 1985 in Hurdy, Alta., BCFP's 140,000-tpy TMP mill planned at the same time for the same area, newsprint machines planned by F.F. Soucy Inc. and Kruger Inc. for Quebec, a Soucy TMP plant, and a Western Forest Products Ltd. kraft pulp mill, along with other projects that are under study by many companies but were not yet officially announced.

B.C.'s share of Canadian pulp capacity will grow considerably, with 7.3 million tpy of capacity located in that province in 1983 out of 24.8 million tpy nationally, making it an extremely close second to Quebec's 8.0 million tpy.

Paper-grade chemical pulp capacity in B.C. will rise by 10.4% in the three-year period to 5.0 million tpy, while capacity elsewhere in Canada will show little change. Paper-grade mechanical pulp in B.C. will jump by 65.6% to 2.1 million tpy, while Quebec's capacity in mechanical pulp will rise 10.9% to 4.5 million tpy. Mechanical pulp capacity in the Atlantic provinces will increase by 26.2% to 1.8 million tpy. Capacity in Ontario and the prairie provinces for that grade of pulp will show little change.

In paper and board capacity, B.C. will claim capacity of 2.9 million tpy in 1983 out of 17 million tpy in all of Canada, making it still a distant third behind the 7.4 million tpy of Que. and the 4.2 million tpy of Ontario. B.C. newsprint capacity is scheduled for a 36.9% in-

Table 1. **Canadian industry annual capacity growth, 1980-83**
(000 metric tons)

Market pulp	**1980**	**1981**	**1982**	**1983**
Dissolving and special alpha	340	355	375	385
Sulfite paper grades	360	365	355	345
Sulfate paper grades	6330	6415	6655	6725
Bleached softwood	4905	4975	5235	5310
Semibleached softwood	550	505	505	505
Bleached hardwood	605	630	635	630
Unbleached	270	305	280	280
Total chemical paper grades (excludes dissolving and special alpha)	6690	6780	7010	7070
Increase from previous year	238	90	230	60
	3.7%	1.3%	3.4%	0.9%
Mechaical	240	260	475	475
Total market pulp capacity	**7270**	**7395**	**7860**	**7930**
Increase from previous year	158	125	465	70
	2.2%	1.7%	6.3%	0.9%

Paper and board	**1980**	**1981**	**1982**	**1983**
Newsprint	9130	9445	10,070	10,500
Groundwood printing and specialty	660	725	785	865
Book, writing, and miscellaneous	982	1025	1091	1130
Kraft papers	562	583	564	552
Multiwall sack	278	283	262	263
Other kraft papers	284	300	302	289
Special papers	38	37	37	37
Greaseproof, glassine, and others	19	18	18	18
Tissue (other than sanitary)	19	19	19	19
Sanitary papers	399	434	459	464
Containerboard	1818	1859	1897	1913
Kraft linerboard	958	974	998	1000
Recycled linerboard	262	279	285	292
Semichemical corrugating medium	495	500	505	510
Recycled corrugating medium	103	106	109	111
Boxboard	807	805	819	833
Solid bleached	95	95	100	103
Folding (excluding solid bleached)	319	324	335	345
Other boxboard	393	386	384	385
Total excluding building and other	14,396	14,913	15,722	16,294
Building and other	750	730	730	745
Wet machine board	5	10	10	15
Building papers	276	276	276	276
Building board, soft	264	264	264	274
Building board, hard	205	180	180	180
Total paper and board capacity	15,146	15,643	16,452	17,039
Increase from previous year	50	497	809	587
	—	3.3%	5.2%	3.6%

Source: Canadian Pulp & Paper Assn. Capacity Survey 1980-83

crease to 1.9 million tpy, far outstripping the rate of growth for other regions. Quebec's newsprint capacity expansion will be 9.1% to 4.7 million tpy, and Ontario's capacity will go up 9.8% to 2.0 million tpy. The Atlantic provinces are expected to show a 19.2% jump to 1.8 million tpy. □

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